Some Biological Statistics on Atlantic Salmon Parr from the Miramichi River System, New Brunswick

E J. Schofield and J.L. Peppar

Freshwater and Anadromous Division
Resource Branch
Department of Fisheries and Oceans
Halifax, Nova Scotia B3J 2S7

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ABSTRACT

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Over the period September 15-October 10, 1980, electroseining operations were conducted on 14 different streams throughout the Miramichi River system, New Brunswick, to acquire samples of Atlantic salmon parr for biological analysis (length, weight, age and sex). The objective of this sampling was, primarily, to select small parr (mostly age 1+) and large parr (mostly age 2+) and determine the extent of precocious development amongst the males. This report summarizes data obtained from those samples.

Key words: Atlantic salmon, Miramichi River, parr, length, weight, age, sex, precocious development.

RÉSUMÉ

Schofield, E.J. and J.L. Peppar. 1982. Some biological statistics on Atlantic salmon parr from the Miramichi River system, New Brunswick. Can. Data Rep. Fish. Aquat. Sci. No. 322. vii + 15 p.

Du 15 septembre au 10 octobre 1980, des échantillons de parr de saumon atlantique ont été capturés par électrosennage dans 14 cours d'eau du réseau de la rivière Miramichi (Nouveau-Brunswick) en vue d'analyses biologiques (longueur, poids, âge et sexe). L'objectif était surtout de choisir des parr de petite taille (d'âge 1+ pour la plupart) et des parr plus grands (d'âge 2+ pour la plupart) et de déterminer le degré de développement précoce chez les mâles. Nous présentons dans le rapport qui suit un résumé des données recueillies sur ces échantillons.

Mots-clés : saumon atlantique, rivière Miramichi, parr, longueur, poids, âge, sexe, développement précoce.

INTRODUCTION

Electroseining operations have been conducted throughout the freshwater reaches of the Miramichi River system, northeastern New Brunswick, to assess population densities of juvenile Atlantic salmon (*Salmo salar*) and other fish species present (Peppar and Schofield 1978; Schofield and Peppar 1979). These operations were carried out, primarily, to determine relative spawning success in realtion to increased or decreased escapements of adults to the river system. With this objective in mind, operations each year have concentrated on the sampling of sites sampled in previous years, to allow consecutive-year comparisons of the calculated population densities.

In 1980, in order to increase biological information not normally gathered directly from the juvenile-salmon assessment program, new sites were sampled above and below established seining sites, and juvenile salmon were removed for subsequent length, weight, age and sex analyses. The objective of this sampling was, primarily, to select both small parr (mostly age 1+) and large parr (mostly age 2+) and to determine the extent of precocious development amongst the males. The following report summarizes data obtained from these samples, all collected over the period September 15-October 10, 1980.

SCOPE OF OPERATIONS

The samples were obtained from sites either above or below the established electroseining sites on 14 streams currently included in the juvenile-salmon assessment program (Fig.). The streams were selected to be representative of the three major areas of the Miramichi River system, and included:

1. Main Miramichi - streams flowing into Miramichi estuary or bay: Bartibog River.

2. Northwest Miramichi - streams flowing into the Northwest Miramichi River: Little Southwest Miramichi River, Northwest Miramichi River, Little Sevogle River and Big Sevogle River.

3. Southwest Miramichi - streams flowing into the Southwest Miramichi River: Main Southwest Miramichi River, Renous River, Dungarvon River, Cains River, Big Hole Brook, Betts Mill Brook, Burntland Brook, Taxis River and Rocky Brook.

The main objective of the sampling program was to collect approximately 440 small parr (primarily age 1+) and 440 large parr (primarily age 2+) from the 14 selected streams - sampling intensities of of 40-80 fish/stream. This objective could not be reached, however, due to limited accessibility on some streams, the widespread scarcity of parr (especially large parr) encountered and the above-normal water flows experienced on most streams. A total of 813 salmon was collected. These were divided into fork-length groups of 6.0 cm-10.0 cm and ≥10.0 cm, to differentiate small parr and large parr, respectively.

METHODS

Methods and materials employed in the seining operations were similar to those already described (Peppar and Schofield 1978). However, as the operations were conducted to obtain samples and not to derive quantitative estimates, barrier nets were not employed; an apron seine was used.

At capture, obvious fry (underyearlings) were released and the remainder were retained and taken ashore; there, the specimens were counted, measured and grouped as to small and large parr. This procedure was repeated until a specific quota was reached, or, until the operations failed to turn up any more parr from the site. Specimens were then returned to the Millbank laboratory facilities in iced water, whereupon they were appropriately labelled and stored in a chest-freezer (in plastic bags partially filled with water).

To prepare samples for analysis, each was allowed to thaw at room temperature. A measuring board was used to determine fork and total lengths to the nearest 0.1 cm. Weights were recorded to the nearest 0.01 g with a Mettler 1500 balance. Age was determined by scale reading. Scales were read under water with a binocular microscope at medium (40x) power. Sexing of the gonads was done by both ordinary visual and microscopic examination. Gonads of all precocious male parr were removed and weighed to the nearest 0.01 g.

RESULTS

A total of 813 "anticipated" parr was collected. This total was reduced to 595 parr (380 small and 215 large), after aging determined that 218 fish were fry (underyearlings). The tables to follow summarize all data derived from the analyses of these parr; data derived from the fry have also been included when possible.

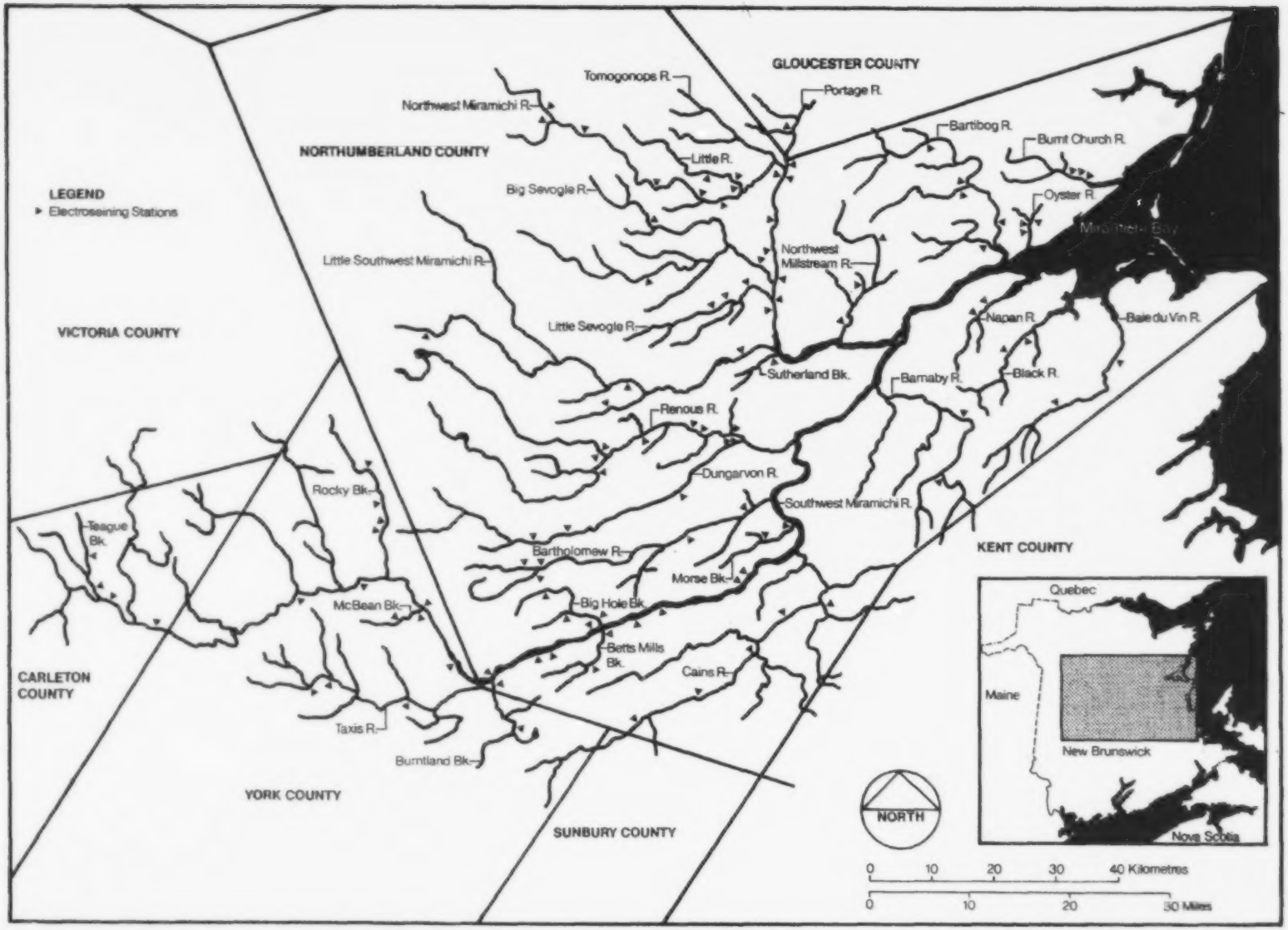

FIG. Electroseining stations used in juvenile salmon population assessments, Miramichi River system, New Brunswick. (Schofield and Peppar 1979)

TABLE 1. Age determinations of 813 juvenile Atlantic salmon, collected by electroseining in 14 branches of the Miramichi River system, 1980.

Stream	Total sample size	No. of fry (0+)	No. of parr (% of total parr) 1+	2+	3+
Bartibog River	81	13	42 (61.8)	26 (38.2)	0 (0.0)
Little Southwest Miramichi River	80	29	34 (66.7)	17 (33.3)	0 (0.0)
Northwest Miramichi River	80	10	27 (38.6)	43 (61.4)	0 (0.0)
Little Sevogle River	21	11	8 (80.0)	2 (20.0)	0 (0.0)
Big Sevogle River	42	9	18 (54.5)	15 (45.5)	0 (0.0)
Main Southwest Miramichi River	77	44	27 (81.8)	6 (18.2)	0 (0.0)
Renous River	59	23	20 (55.6)	16 (44.4)	0 (0.0)
Dungarvon River	53	13	22 (55.0)	18 (45.0)	0 (0.0)
Cains River	78	27	42 (82.4)	9 (17.6)	0 (0.0)
Big Hole Brook	30	10	18 (90.0)	2 (10.0)	0 (0.0)
Betts Mill Brook	49	4	36 (80.0)	8 (17.8)	1 (2.2)
Burntland Brook	50	7	31 (72.1)	12 (27.9)	0 (0.0)
Taxis River	49	14	27 (77.1)	8 (22.9)	0 (0.0)
Rocky Brook	64	4	28 (46.7)	28 (46.7)	4 (6.6)

TABLE 2. Ranges and means of fork-lengths, by age, for the 14 river samples (813 fish) of juvenile Atlantic salmon collected by electroseining in the Miramichi River system, 1980.

Stream	Fork lengths (cm)															
	0+				1+				2+				3+			
	n	Range	Mean	SD	n	Range	Mean	SD	n	Range	Mean	SD	n	Range	Mean	SD
Bartibog River	13	5.7-7.0	6.43	0.41	42	8.0-12.5	9.38	1.01	26	11.0-13.4	11.91	0.65	-	-	-	-
Little Southwest Miramichi River	29	5.6-7.0	6.32	0.43	34	8.7-12.0	10.13	0.83	17	9.8-13.2	11.21	1.16	-	-	-	-
Northwest Miramichi River	10	5.6-6.5	5.00	0.33	27	7.6-9.2	8.43	0.41	43	9.0-13.3	11.00	0.79	-	-	-	-
Little Sevogle River	11	5.3-6.0	5.70	0.24	8	7.5-11.0	8.30	1.14	2	11.0-11.8	11.40	0.57	-	-	-	-
Big Sevogle River	9	5.5-6.2	5.81	0.24	18	6.2-10.6	8.81	1.26	15	10.5-13.5	11.85	0.87	-	-	-	-
Main Southwest Miramichi River	44	5.5-7.0	6.18	0.32	27	8.5-14.0	10.25	1.16	6	11.6-13.5	12.65	0.80	-	-	-	-
Renous River	23	5.5-6.5	6.16	0.26	20	8.6-11.5	9.90	0.80	16	9.5-13.2	11.89	0.88	-	-	-	-
Dungarvon River	13	5.5-6.5	6.15	0.37	22	7.7-10.5	8.87	0.77	18	9.5-13.0	11.18	1.13	-	-	-	-
Cains River	27	5.5-6.8	6.20	0.30	42	8.5-12.2	10.03	0.83	9	11.5-13.1	12.30	0.60	-	-	-	-
Big Hole Brook	10	5.5-6.5	6.06	0.37	18	8.0-12.0	9.91	1.19	2	12.2-13.2	12.70	0.71	-	-	-	-
Betts Mill Brook	4	6.0-6.2	6.10	0.12	36	7.0-11.3	9.04	1.46	8	10.3-13.6	12.09	0.98	1	-	13.50	0
Burntland Brook	7	5.1-6.6	6.16	0.51	31	8.8-11.5	9.74	1.05	12	10.2-13.0	12.07	0.78	-	-	-	-
Taxis River	14	5.5-6.6	6.18	0.30	27	8.5-12.7	9.83	0.88	8	11.3-13.3	12.20	0.71	-	-	-	-
Rocky Brook	4	5.3-6.0	5.63	0.30	28	7.0-8.7	7.68	0.51	28	9.2-11.2	10.18	0.61	4	11.0-14.0	12.35	1.48
Totals and overall means	218	5.1-7.0	6.15	0.38	380	6.2-14.0	9.39	1.23	210	9.0-13.6	11.44	1.06	5	11.0-14.0	12.58	1.28

TABLE 3. Length-frequency (fork length) breakdown, by river samples, for all juvenile Atlantic salmon (813 fish) collected by electroseining in the Miramichi River system, 1980.

Fork length (cm)	Stream totals[1]														Overall totals
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
5.1-5.5	0	0	0	4	1	4	4	2	1	2	0	1	1	2	22
5.6-6.0	3	9	6	7	7	23	16	3	10	4	2	1	5	2	99
6.1-6.5	6	11	4	0	2	16	3	8	15	4	2	4	7	0	82
6.6-7.0	4	8	0	0	1	1	0	0	1	0	2	1	1	6	25
7.1-7.5	0	0	0	1	2	0	0	0	0	0	7	0	0	4	14
7.6-8.0	1	0	6	4	1	0	0	5	0	1	4	2	0	14	38
8.1-8.5	10	0	13	2	4	1	0	4	1	2	2	1	1	3	44
8.6-9.0	9	3	9	0	1	4	3	4	4	1	3	5	5	1	52
9.1-9.5	8	7	2	0	2	3	7	6	2	4	4	7	8	7	67
9.6-10.0	6	14	1	0	3	5	4	6	11	3	2	5	2	5	67
10.1-10.5	2	8	8	0	3	5	3	3	11	1	5	6	6	9	70
10.6-11.0	9	8	13	2	2	4	4	5	8	3	6	1	4	6	75
11.1-11.5	5	5	9	0	6	2	4	2	5	2	3	7	2	3	55
11.6-12.0	7	2	8	1	3	4	6	1	2	1	1	2	1	0	39
12.1-12.5	8	3	0	0	0	1	3	1	4	1	4	4	3	0	32
12.6-13.0	2	1	0	0	2	1	0	3	2	0	1	3	2	0	17
13.1-13.5	1	1	1	0	2	2	2	0	1	1	0	0	1	1	13
13.6-14.0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	3
Totals	81	80	80	21	42	77	59	53	78	30	49	50	49	64	813

[1]Streams are identified according to number in the following list:

Number	Stream name	Number	Stream name
1	Dartibog River	8	Dungarvon River
2	Little Southwest Miramichi River	9	Cains River
3	Northwest Miramichi River	10	Big Hole Brook
4	Little Sevogle River	11	Betts Mill Brook
5	Big Sevogle River	12	Burntland Brook
6	Main Southwest Miramichi River	13	Taxis River
7	Renous River	14	Rocky Brook

TABLE 4. Mean fork lengths, by age, for the 309 precocious (developed) and non-precocious (non-developed) male, Atlantic salmon parr collected by electroseining in 14 branches of the Miramichi River system, 1980.

	Fork lengths (cm)																	
	1+						2+						3+					
	Non-developed			Developed			Non-developed			Developed			Non-developed			Developed		
Stream	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD
Bartibog River	9.62	5	1.52	9.27	19	0.58	-	0	-	11.84	11	0.57	-	-	-	-	-	-
Little Southwest Miramichi River	10.09	8	0.82	9.43	6	0.45	10.97	3	1.80	11.36	7	1.20	-	-	-	-	-	-
Northwest Miramichi River	8.37	13	0.47	8.50	1	-	11.03	15	0.80	10.55	2	0.07	-	-	-	-	-	-
Little Sevogle River	7.80	3	0.17	8.15	2	0.49	-	0	-	12.70	1	-	-	-	-	-	-	-
Big Sevogle River	9.60	2	0.57	8.62	6	1.11	12.20	4	1.06	11.05	4	0.53	-	-	-	-	-	-
Main Southwest Miramichi River	10.01	11	0.78	10.08	4	1.22	-	3	-	12.83	3	0.76	-	-	-	-	-	-
Renous River	9.03	3	0.45	9.67	6	0.54	12.00	1	-	11.62	6	1.13	-	-	-	-	-	-
Dungarvon River	8.70	6	0.46	8.75	4	0.77	10.85	4	0.66	10.58	5	1.43	-	-	-	-	-	-
Cains River	10.62	6	0.56	9.90	16	0.92	11.50	2	0.00	12.80	2	0.42	-	-	-	-	-	-
Big Hole Brook	10.16	7	0.92	9.34	5	1.19	-	0	-	-	0	-	-	-	-	-	-	-
Betts Mill Brook	8.92	18	1.50	8.90	5	1.86	12.30	3	1.18	11.55	2	1.77	-	-	-	12.40	1	-
Burntland Brook	9.66	11	0.72	9.69	8	0.80	12.50	1	-	12.15	2	0.21	-	-	-	-	-	-
Taxis River	9.65	2	1.20	9.70	16	0.73	11.30	1	-	12.45	4	0.40	-	-	-	-	-	-
Rocky Brook	7.71	9	0.49	7.72	6	0.39	10.20	7	0.62	9.88	8	0.60	-	-	-	13.60	2	0.57
Totals and overall means	9.23	104	1.21	9.34	104	1.00	11.16	41	1.04	11.40	57	1.17	-	-	-	13.20	3	0.80

TABLE 5. Ranges and means of total lengths, by age, for the 14 river samples (811 fish) of juvenile Atlantic salmon collected by electroseining in the Miramichi River system, 1980.

Stream	Total lengths (cm)															
	0+				1+				2+				3+			
	n	Range	Mean	SD	n	Range	Mean	SD	n	Range	Mean	SD	n	Range	Mean	SD
Bartibog River	13	6.0-7.4	6.88	0.43	42	8.5-13.5	10.11	1.09	26	11.8-14.4	12.79	0.70	-	-	-	-
Little Southwest Miramichi River	29	6.0-7.4	6.80	0.44	34	9.3-12.5	10.99	0.92	17	10.7-14.0	12.06	1.25	-	-	-	-
Northwest Miramichi River	10	6.0-7.0	6.42	0.37	27	8.1-9.8	8.99	0.42	43	9.6-14.3	11.89	0.86	-	-	-	-
Little Sevogle River	11	5.7-6.4	6.14	0.22	8	8.0-11.8	8.95	1.24	2	11.9-12.7	12.30	0.57	-	-	-	-
Big Sevogle River	9	6.0-6.7	6.29	0.25	18	6.6-11.5	9.47	1.44	15	11.0-14.3	12.71	0.94	-	-	-	-
Main Southwest Miramichi River	44	6.0-7.1	6.54	0.33	26	9.1-15.0	11.08	1.27	6	12.5-14.4	13.50	0.90	-	-	-	-
Renous River	23	6.0-7.0	6.34	0.29	20	9.5-10.5	10.81	0.87	16	10.0-14.1	12.82	0.98	-	-	-	-
Dungarvon River	13	5.7-7.1	6.60	0.47	21	9.6-11.5	9.55	0.89	18	10.0-14.0	11.98	1.24	-	-	-	-
Cains River	27	6.0-7.3	6.69	0.34	42	9.0-13.2	11.02	0.92	9	12.3-14.1	13.26	0.59	-	-	-	-
Big Hole Brook	10	6.0-7.0	6.56	0.37	18	8.8-13.0	10.82	1.25	2	13.1-14.0	13.55	0.64	-	-	-	-
Betts Mill Brook	4	6.5-6.9	6.73	0.21	36	7.7-12.2	9.94	1.63	8	11.3-14.7	13.16	1.00	1	-	13.50	-
Burntland Brook	7	5.5-7.2	6.66	0.56	31	8.2-12.6	10.55	1.14	12	11.1-14.0	13.00	0.89	-	-	-	-
Taxis River	14	6.0-7.1	6.64	0.29	27	9.0-13.6	10.59	1.01	8	12.2-14.4	13.13	0.72	-	-	-	-
Rocky Brook	4	5.5-6.4	5.98	0.37	28	7.4-8.7	8.24	0.55	28	10.0-12.2	10.96	0.67	4	12.0-15.0	13.25	1.50
Totals and overall means	218	5.5-6.4	6.56	0.41	378	6.6-15.0	10.20	1.36	210	9.6-14.7	12.19	1.14	5	12.0-15.0	13.30	1.30

TABLE 6. Length-frequency (total length) breakdown, by river samples, for all juvenile Atlantic salmon (811 fish) collected by electroseining in the Miramichi River system, 1980.

Total length (cm)	Stream totals[1]														Overall totals
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
5.1–5.5	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
5.6–6.0	1	2	3	5	1	4	5	2	1	2	0	0	1	2	29
6.1–6.5	3	8	5	6	6	24	14	3	10	4	1	1	4	1	90
6.6–7.0	5	13	2	0	3	14	4	7	13	4	3	4	8	0	80
7.1–7.5	4	5	0	0	1	1	0	1	3	0	0	1	1	5	22
7.6–8.0	0	1	0	1	2	1	0	0	0	0	7	0	0	5	17
8.1–8.5	1	0	5	4	1	0	0	4	0	0	6	1	0	10	32
8.6–9.0	7	0	14	1	4	0	0	5	1	2	1	2	1	7	45
9.1–9.5	5	1	6	1	0	2	2	1	2	2	2	4	3	1	32
9.6–10.0	10	6	5	0	2	4	3	6	4	0	2	3	6	4	55
10.1–10.5	9	8	0	0	1	3	7	5	5	5	4	8	5	6	66
10.6–11.0	2	11	2	0	5	7	2	4	12	3	2	2	4	7	63
11.1–11.5	3	6	8	0	3	2	3	3	7	0	4	6	4	5	54
11.6–12.0	8	8	13	2	0	4	4	5	7	3	6	2	3	7	72
12.1–12.5	5	4	8	0	7	3	4	1	4	2	4	5	2	1	50
12.6–13.0	9	2	8	1	2	2	6	1	3	1	1	3	3	0	42
13.1–13.5	6	3	0	0	1	1	3	1	2	1	4	2	1	0	25
13.6–14.0	2	2	0	0	1	1	0	3	3	1	1	5	2	1	22
14.1–14.5	1	0	1	0	2	2	2	0	1	0	0	0	1	0	10
14.6–15.0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	3
Totals	81	80	80	21	42	76	59	52	78	30	49	50	49	64	811

[1]Streams are identified according to number in the following list:

Number	Stream name	Number	Stream name
1	Bartibog River	8	Dungarvon River
2	Little Southwest Miramichi River	9	Cains River
3	Northwest Miramichi River	10	Big Hole Brook
4	Little Sevogle River	11	Betts Mill Brook
5	Big Sevogle River	12	Burntland Brook
6	Main Southwest Miramichi River	13	Taxis River
7	Renous River	14	Rocky Brook

TABLE 7. Mean total-lengths, by age, for the 308 precocious (developed) and non-precocious (non-developed) male, Atlantic salmon parr collected by electroseining in 14 branches of the Miramichi River system, 1980.

Stream	Total lengths (cm)																	
	1+						2+						3+					
	Non-developed			Developed			Non-developed			Developed			Non-developed			Developed		
	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD
Bartibog River	10.36	5	1.71	10.03	19	0.66	-	0	-	12.70	11	0.60	-	-	-	-	-	-
Little Southwest Miramichi River	10.81	8	0.90	10.23	6	0.57	11.83	3	1.93	12.23	7	1.26	-	-	-	-	-	-
Northwest Miramichi River	8.89	13	0.50	9.00	1	-	11.90	15	0.84	11.40	2	0.00	-	-	-	-	-	-
Little Sevogle River	8.33	3	0.15	8.90	2	0.71	-	0	-	12.70	1	-	-	-	-	-	-	-
Big Sevogle River	10.45	2	0.64	9.23	6	1.27	13.13	4	0.96	11.78	4	0.64	-	-	-	-	-	-
Main Southwest Miramichi River	10.86	11	0.80	10.85	4	1.37	-	0	-	13.63	3	1.03	-	-	-	-	-	-
Renous River	9.90	3	0.53	10.52	6	0.74	13.00	1	-	12.50	6	1.30	-	-	-	-	-	-
Dungarvon River	9.30	5	0.37	9.45	4	0.90	11.63	4	0.95	11.38	5	1.52	-	-	-	-	-	-
Cains River	11.42	6	0.60	10.69	16	1.01	12.50	2	0.00	13.85	2	0.35	-	-	-	-	-	-
Big Hole Brook	11.10	7	0.95	10.20	5	1.28	-	0	-	-	0	-	-	-	-	-	-	-
Betts Mill Brook	9.81	18	1.67	9.84	5	2.08	13.37	3	1.19	12.55	2	1.77	-	-	-	13.50	1	-
Burntland Brook	10.42	11	0.75	10.46	8	0.76	13.60	1	-	13.15	2	0.07	-	-	-	-	-	-
Taxis River	10.45	2	1.48	10.43	16	0.81	12.20	1	-	13.30	4	0.38	-	-	-	-	-	-
Rocky Brook	8.26	9	0.49	8.27	6	0.43	10.94	7	0.70	10.69	8	0.62	-	-	-	14.50	2	0.71
Totals and overall means	9.99	103	1.34	10.10	104	1.10	12.04	41	1.13	12.25	57	1.24	-	-	-	14.17	3	0.76

TABLE 8. Mean weights, by age, for the 309 precocious (developed) and non-precocious (non-developed) male, Atlantic salmon parr collected by electroseining in 14 branches of the Miramichi River system, 1980.

	Mean weights (g)																	
	1+						2+						3+					
	Non-developed			Developed			Non-developed			Developed			Non-developed			Developed		
Stream	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD
Bartibog River	10.96	5	5.01	10.63	19	2.30	-	0	-	24.45	11	4.62	-	-	-	-	-	-
Little Southwest Miramichi River	11.29	8	2.51	10.90	6	2.70	14.83	3	8.99	18.97	7	6.55	-	-	-	-	-	-
Northwest Miramichi River	6.72	13	1.25	7.84	1	-	15.88	15	3.07	13.72	2	0.14	-	-	-	-	-	-
Little Sevogle River	5.14	3	0.46	6.82	2	0.96	-	0	-	20.90	1	-	-	-	-	-	-	-
Big Sevogle River	11.26	2	2.95	8.37	6	3.83	22.67	4	4.51	17.80	4	3.91	-	-	-	-	-	-
Main Southwest Miramichi River	12.33	11	2.88	14.13	4	6.08	-	0	-	28.08	3	3.15	-	-	-	-	-	-
Renous River	9.13	3	1.61	11.25	6	1.33	19.32	1	-	20.45	6	5.24	-	-	-	-	-	-
Dungarvon River	8.02	6	1.20	9.26	4	2.85	14.87	4	2.74	16.12	5	7.98	-	-	-	-	-	-
Cains River	14.70	6	1.87	13.75	16	4.46	16.93	2	2.45	26.65	2	2.68	-	-	-	-	-	-
Big Hole Brook	12.18	7	2.88	11.13	5	5.01	-	0	-	-	0	-	-	-	-	-	-	-
Betts Mill Brook	8.91	18	4.20	9.47	5	4.24	21.58	3	5.67	20.40	2	7.15	-	-	-	19.76	1	-
Burntland Brook	10.28	11	2.13	11.38	8	3.20	21.29	1	-	22.37	2	2.60	-	-	-	-	-	-
Taxis River	8.91	2	1.68	11.60	16	2.81	15.81	1	-	24.48	4	1.30	-	-	-	-	-	-
Rocky Brook	5.24	9	0.81	5.69	6	1.06	11.82	7	2.23	11.79	8	1.77	-	-	-	28.62	2	4.96
Totals and overall means	9.55	104	3.66	10.90	104	3.73	16.35	41	4.78	20.00	57	6.46	-	-	-	25.67	3	6.20

TABLE 9. Mean weights, by age, for the 14 river samples (813 fish) of juvenile Atlantic salmon collected by electroseining in the Miramichi River system, 1980.

	Mean weights (g)											
	0+			1+			2+			3+		
Stream	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD
Bartibog River	3.06	13	0.56	10.59	42	3.66	22.07	26	4.54	-	-	-
Little Southwest Miramichi River	2.92	29	0.54	12.41	34	3.27	17.62	17	6.08	-	-	-
Northwest Miramichi River	2.58	10	0.48	6.90	27	1.09	15.98	43	3.31	-	-	-
Little Sevogle River	1.97	11	0.22	6.59	8	2.51	18.64	2	3.20	-	-	-
Big Sevogle River	2.48	9	0.24	8.75	18	4.02	20.36	15	4.24	-	-	-
Main Southwest Miramichi River	2.62	44	0.41	13.47	27	4.89	25.86	6	3.89	-	-	-
Renous River	2.47	23	0.35	11.86	20	2.59	20.99	16	4.13	-	-	-
Dungarvon River	2.72	13	0.50	8.74	22	2.27	17.34	18	5.35	-	-	-
Cains River	3.10	27	0.49	13.90	42	3.23	22.74	9	4.05	-	-	-
Big Hole Brook	2.48	10	0.41	12.05	18	3.94	25.95	2	6.40	-	-	-
Betts Mill Brook	2.86	4	0.21	9.84	36	3.98	20.93	8	4.25	19.76	1	0.00
Burntland Brook	2.87	7	0.60	11.04	31	3.38	20.12	12	4.17	-	-	-
Taxis River	2.72	14	0.33	11.65	27	3.70	22.41	8	4.02	-	-	-
Rocky Brook	1.98	4	0.38	5.27	28	1.06	12.15	28	2.05	22.37	4	7.77
Totals and overall means	2.70	218	0.52	10.53	380	3.75	18.53	210	5.39	21.85	5	6.83

TABLE 10. Sex composition (percentage), by age, for the 14 river samples (811 fish) of juvenile Atlantic salmon collected by electroseining in the Miramichi River system, 1980.

	Sex (%)											
	0+			1+			2+			3+		
Stream	n	M	F	n	M	F	n	M	F	n	M	F
Bartibog River	13	53.8	46.2	42	57.1	42.9	26	42.3	57.7	-	-	-
Little Southwest Miramichi River	29	62.1	37.9	34	41.2	58.8	17	58.8	41.2	-	-	-
Northwest Miramichi River	10	80.0	20.0	27	51.9	48.2	43	39.5	60.5	-	-	-
Little Sevogle River	11	81.8	22.2	8	62.5	37.5	2	50.0	50.0	-	-	-
Big Sevogle River	9	77.8	22.2	18	44.4	55.6	15	53.3	46.7	-	-	-
Main Southwest Miramichi River	44	68.2	31.8	27	55.6	44.4	6	50.0	50.0	-	-	-
Renous River	22	77.3	22.7	20	45.0	55.0	16	43.8	56.2	-	-	-
Dungarvon River	13	61.5	38.5	22	45.5	54.5	18	50.0	50.0	-	-	-
Cains River	27	51.8	48.2	42	52.4	47.6	9	44.4	55.6	-	-	-
Big Hole Brook	10	80.0	20.0	18	66.7	33.3	2	0.0	100.0	-	-	-
Betts Mill Brook	4	100.0	0.0	36	63.9	36.1	8	62.5	37.5	1	0.0	100.0
Burntland Brook	7	57.1	42.9	31	61.3	38.7	12	25.0	75.0	-	-	-
Taxis River	13	61.5	38.5	27	66.7	33.3	8	62.5	37.5	-	-	-
Rocky Brook	4	0.0	100.0	28	53.6	46.4	28	53.6	46.4	4	50.0	50.0
Totals and overall percentages	216	65.7	34.3	380	54.7	45.3	210	46.7	53.3	5	40.0	60.0

TABLE 11. Numbers and percentages, by age, of the 311 precocious (developed) and non-precocious (non-developed) male Atlantic salmon parr collected by electroseining in 14 branches of the Miramichi River system, 1980.

Stream	1+			2+			3+		
	n	Non-dev.	Dev.	n	Non-dev.	Dev.	n	Non-dev.	Dev.
Bartibog River	24	20.8	79.2	11	0.0	100.0	-	-	-
Little Southwest Miramichi River	14	57.1	42.9	10	30.0	70.0	-	-	-
Northwest Miramichi River	14	92.9	7.1	17	88.2	11.8	-	-	-
Little Sevogle River	5	60.0	40.0	1	0.0	100.0	-	-	-
Big Sevogle River	8	25.0	75.0	8	50.0	50.0	-	-	-
Main Southwest Miramichi River	15	73.3	26.7	8	0.0	100.0	-	-	-
Renous River	9	33.3	66.7	7	14.3	85.7	-	-	-
Dungarvon River	10	60.0	40.0	9	44.4	55.6	-	-	-
Cains River	22	27.3	72.7	4	50.0	50.0	-	-	-
Big Hole Brook	12	58.3	41.7	0	0.0	0.0	-	-	-
Betts Mill Brook	23	78.3	21.7	5	60.0	40.0	1	0.0	100.0
Burntland Brook	19	57.9	42.1	3	33.3	66.7	-	-	-
Taxis River	18	11.1	88.9	5	20.0	80.0	-	-	-
Rocky Brook	15	60.0	40.0	15	46.7	53.3	4	50.0	50.0
Overall	208	50.0	50.0	98	41.8	58.2	5	40.0	60.0

TABLE 12. Mean gonad weights, by age, for the 164 precocious male Atlantic salmon parr collected by electroseining in 14 branches of the Miramichi River system, 1980.

Stream	Mean gonad weights (g)								
	1+			2+			3+		
	$\bar{x}$	n	SD	$\bar{x}$	n	SD	$\bar{x}$	n	SD
Bartibog River	1.22	19	0.55	3.00	11	1.26	-	-	-
Little Southwest Miramichi River	1.15	6	0.19	1.24	7	0.54	-	-	-
Northwest Miramichi River	0.62	1	-	1.01	2	0.37	-	-	-
Little Sevogle River	0.76	2	0.16	1.80	1	-	-	-	-
Big Sevogle River	0.94	6	0.50	2.16	4	0.63	-	-	-
Main Southwest Miramichi River	1.50	4	0.85	3.36	3	1.06	-	-	-
Renous River	1.05	6	0.22	1.97	6	0.76	-	-	-
Dungarvon River	0.82	4	0.30	1.53	5	1.01	-	-	-
Cains River	1.43	16	0.49	2.07	2	0.51	-	-	-
Big Hole Brook	0.95	5	0.64	-	0	-	-	-	-
Betts Mill Brook	0.63	5	0.13	1.46	2	0.68	1.05	1	-
Burntland Brook	1.13	8	0.56	2.94	2	0.74	-	-	-
Taxis River	1.33	16	0.46	3.36	4	0.29	-	-	-
Rocky Brook	0.45	6	0.14	0.74	8	0.15	1.79	2	0.69
Overall	1.13	104	0.52	2.03	57	1.16	1.54	3	0.65

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